

NEVADA DIVISION OF ENVIRONMENTAL PROTECTION

FACT SHEET

(pursuant to NAC 445A.874)

Permittee Name: **Department of Defense**

Project Name: **Nellis Air Force Base (AFB): AGE Yard (Facility 267) and Site SS-46**

Address: **Nellis AFB, Las Vegas, Nevada 89191**

Permit Action: **Major Modification to UIC Permit - Draft** Type of Project:

Remediation

Permit Number: **UNEV2001210**

Injection Wells (#): **Nine (9)**

A. Description of Injection

Location: The Nellis AFB Aerospace Ground Equipment Yard (AGE Yard - Facility 267) has four (4) injection wells and Site SS-46 has five (5) injection wells, within the Nellis AFB compound in Las Vegas, Nevada. The wells authorized for 7.0% hydrogen peroxide (H_2O_2) injection at Facility 267 are as follows: 44MW-11, 267IW-1, 267IW-2, and 267MW-3. The wells authorized for reagent grade 4% potassium permanganate injection at Site SS-46 are 46IW-01, 46IW-02, 46MW-109, 46MW-86, and 46MW123. Additional injection wells approved by the UIC Program may be added in the future to both locations. The AGE Yard (Facility 267) is in Section 3 and 4, T20S, R62E, MDB&M, in Clark County. Site SS-46 is in Section 34, T19S, R62E, MDB&M in Clark County.

At the AGE Yard (Facility 267), the depth of the four-inch diameter injection wells is approximately 56-60 feet below ground surface (bgs) with a screened interval starting from 30, 35, or 45 feet bgs and extending to the depth of the wells. Groundwater is present at approximately 36-51 feet bgs and the groundwater flows east-southeast at an average gradient of approximately 0.011 ft/ft.

At Site SS-46, the depth of the two and four-inch diameter injection wells is approximately 95-100 feet below ground surface (bgs) with a screened interval starting from approximately 66-70 feet and extending to the depth of the wells. Groundwater is present at approximately 67-87 feet bgs and the groundwater flows east-southeast at an average gradient of approximately 0.002 ft/ft.

Latitude: 36° 14' 09" N

Longitude: 115° 02' 29" W

Characteristics: The groundwater at Site ST-44 which is adjacent to Facility 267 contains three distinct contaminant plumes including two halogenated volatile organic compound (HVOC) plumes and one dissolved petroleum hydrocarbon plume (BTEX). The permit modification deletes the past activity at the North HVOC plume and adds injection activity at the BTEX plume. The Permittee has requested injection of up to a **7.0 % solution of hydrogen peroxide to chemically oxidize** the dissolved petroleum hydrocarbons. Hydrogen peroxide shall be injected at a maximum of 350 gallons per well per month and shall not exceed a maximum of 4,200 gallons per quarter into four (4) injection wells. Injection will occur by gravity feed.

Hydrogen peroxide at 7.0% is thought to decompose readily into reactive hydroxyl radicals ($OH\bullet$), hydroxyl ions (OH^-) and water (H_2O). The hydroxyl radicals will degrade recalcitrant compounds

such as BTEX and MTBE, by attacking the carbon-hydrogen bonds. Residual hydrogen peroxide not used in the direct oxidation process provides an oxygen source for microbes in the subsurface to enhance biodegradation of contaminants. **Because Fenton's Reaction may potentially occur when 7% hydrogen peroxide is added to natural iron in groundwater, the injection shall be started in well 267IW-2 to verify that the temperature limitations (an increase less than 20°F degrees) are met in the closest downgradient well 267IW-3.** Monitoring of adjacent wells 44MW-19 and 44MW-14 has not indicated the presence of ferrous iron (Fe^{+2}) above laboratory detection limits for the last six monitoring events.

The groundwater at Site SS-46 contains three distinct and commingled contaminant plumes, each with separate sources. These are a HVOC plume, a BTEX plume, and a MTBE plume. This permit is for the remediation of the HVOC plume. The injectate at Site SS-46 consists of a 4% reagent grade potassium permanganate solution (KMnO_4) prepared by mixing 66 pounds of reagent grade crystalline KMnO_4 with 200 gallons of potable water into five (5) injection wells. Injection will occur by gravity feed. The injection of reagent grade KMnO_4 will be limited to a maximum of 250 gallons per well every 6 months. Afterward, the injection of 50 gallons of potable water per well is permitted to aid in the distribution of the KMnO_4 .

B. Synopsis

March 2006: North HVOC Facility	Major Modification drafted: deleted 3.5% H_2O_2 injection in Site ST-44 plume; added 7.0% H_2O_2 injection in BTEX plume at AGE Yard-267.
July 2005:	Minor Modification: required reagent grade KMnO_4 ; added 50 gal. potable water for injection; added VOC scan for monitoring wells.
September 2004:	Minor Modification: added 3 injection and monitoring wells; added inorganic monitoring (including metal contaminants in KMnO_4).
September 2003:	Major Modification: added Pilot Test for KMnO_4 injection at Site SS-46.
December 2001:	UIC Permit Issued.

Site ST-44 encompasses various aircraft maintenance and support facilities, including the flightline fire station, inspection hanger and the AGE yard. Three underground storage tanks (USTs) containing gasoline, diesel and jet fuel (JP-4) were present at this site from 1964 to 1989. During the removal of the tanks in 1989, it was determined that product had leaked. A new fueling facility was constructed in 1989 that included new USTs containing JP-4 and gasoline. In 1993, Nellis AFB transitioned from the use of JP-4 to JP-8.

Several groundwater monitoring wells were constructed to evaluate the extent of the contamination at the site between 1989 and 1994. In addition to the contamination released from the USTs, historic activities at the hangar and fire station were reported to include washing floors with chlorinated solvents and utilizing petroleum hydrocarbons for miscellaneous daily operations. It has been determined that groundwater at this site has consequently been impacted by both petroleum hydrocarbons and chlorinated solvents.

In September 1998, tightness and integrity testing indicated the JP-8 UST was leaking. The tank was immediately emptied and replaced. During the UST removal, contaminated soil was observed along the bottom of the tank excavation thus prompting a new groundwater investigation at the AGE Yard. The fuel releases at the Site resulted in a commingled dissolved-phase BTEX plume that extends southeast from the AGE Yard to the Runway 21R.

On August 15, 2001, a single injection event was authorized by NDEP for the injection of a dilute solution of hydrogen peroxide.

A 3.5 % hydrogen peroxide solution was permitted for injection into the North HVOC plume during August 2001 through February 2004. Review of groundwater analytical data collected since initiation of 3.5% hydrogen peroxide injections indicate limited effectiveness towards the reduction of HVOC concentrations in groundwater. Chlorinated solvents typically biodegrade more effectively in an anaerobic environment and consequently are not expected to respond as favorably as the petroleum hydrocarbons in the enhanced aerobic environment stimulated by the injection of hydrogen peroxide.

Site SS-46 is in the northern part of Nellis AFB. The source of the HVOC plume (that includes PCE, TCE, and 1,1-DCE) is Propulsion Maintenance (Building 858). The source of the MTBE plume was determined to be off-base, likely the up-gradient and privately-owned petroleum product tank farms, northwest of the Site. The source of the BTEX plume is undetermined, but was concluded by Black & Veatch (2003) to likely be the Former Test Cell Area, the Nellis AFB JP-8 supply pipeline, and/or an off-base source.

In-situ chemical oxidation by KMnO_4 was selected for evaluation as a remedial option for the HVOC plume. The UIC permit was modified on September 22, 2003 to include Pilot Tests of KMnO_4 injections in two wells: 46MW-86 and 46MW-123. The first Pilot Test occurred in November 2003.

The UIC permit was modified on September 29, 2004 to add three additional injection wells at Site SS-46: 46IW-01, 46IW-02, and 46MW-109. The KMnO_4 solution will be injected at very low flow rates and volumes and is consequently not expected to facilitate contaminant migration. Monitoring will be required at both Sites to verify that the injection activities are not causing the contamination to migrate.

C. Receiving Water Characteristics:

The geology encountered during well construction consists of typically fine-grained alluvial deposits including silty sand, silty clay and clayey silt to a depth of approximately 105 feet below ground surface (bgs). Alluvium is intermittently cemented with calcium carbonate (caliche) layers that typically range from less than one inch thick to greater than ten feet thick.

The Bureau of Water Pollution Control's ArcIMS Data Mapper Tool was checked for the location of Public Water Supply Wells in the area. There were four wells within 7000 feet of the site. The well owners will be sent a copy of the Public Notice.

The groundwater quality at Site ST-44 has demonstrated the following concentrations that exceed state and federal action levels, as determined by groundwater samples analyzed the last four quarters (4th Q 2004 – 4th Q 2005):

TABLE 1: SITE ST-44 GROUNDWATER QUALITY

Constituent	Existing Groundwater Concentration	Limit
Benzene	<1 to 10,100 ppb	5 ppb (State and Federal Limit)
Toluene	<5 to 7,000 ppb	1000 ppb (State and Federal Limit)
Ethylbenzene	<5 to 1,810 ppb	700 ppb (State and Federal Limit)
1,2-Dichloroethane (1,2-DCA)	<5 to 315 ppb	5 ppb (State and Federal Limit)
Perchloroethene (PCE)	<5 to 31 ppb	5 ppb (State and Federal Limit)
Trichloroethene (TCE)	<5 to 669 ppb	5 ppb (State and Federal Limit)
cis-1,2-Dichloroethene (cis-DCE)	<5 to 12 ppb	70 ppb (State and Federal Limit)

During the most recent monitoring event in October 2005, free phase hydrocarbon product (LNAPL) was not present in the 48 groundwater monitoring wells at Site ST-44. LNAPL was previously encountered in the proximity of the JP-8 release at the AGE Yard and in groundwater monitoring well 44MW-5 in the 1989 JP-4 and gasoline release at Site ST-44. A total of approximately 33 gallons of LNAPL was removed from the SVE wells from February 2004 through May 2005.

Groundwater sampling at Site SS-46 has shown a halogenated volatile organic compound (HVOC) plume that includes PCE, TCE, and 1,1-DCE above state and federal action levels (3rd Q 2004 – 2nd Q 2005):

TABLE 2: SITE SS-46 GROUNDWATER QUALITY

Constituent	Existing Groundwater Concentration	Limit
Perchloroethene (PCE)	<5 to 24 ppb	5 ppb (State and Federal Limit)
Trichloroethene (TCE)	<5 to 230 ppb	5 ppb (State and Federal Limit)
1,1-Dichloroethene (1,1-DCE)	<5 to 10 ppb	7 ppb (State and Federal Limit)
Benzene	<1 to 800+ ppb	5 ppb (State and Federal Limit)
MTBE	<1 to 5,000+ ppb	20 or 200 ppb (State Limit)

D. Procedures for Public Comment

Notice of the Division's intent to issue a modified permit authorizing the facility to inject into the groundwater of the State of Nevada will be sent to the Las Vegas Review Journal for publication. The notice will also be mailed to interested persons on our mailing list.

Anyone wishing to comment on the proposed permit can do so in writing for a period of 30 days following the publication date of the said public notice. The comment period can be extended at the discretion of the Administrator. All written comments received during the comment period will be retained and considered in the final determination.

A public hearing on the proposed determination can be requested by the applicant, any affected state, any affected interstate agency, the regional administrator of EPA Region IX or any interested agency, person or group of persons.

Any public hearing determined by the Administrator to be held must be conducted in the geographical area of the proposed discharge or any other area the Administrator determines to be appropriate. All public hearings will be conducted in accordance with NAC 445A.238.

The final determination of the Administrator may be appealed to the State Environmental Commission pursuant to NRS 445A.605.

E. Proposed Determination

The Division has made the tentative determination to modify the permit as requested. The original permit was issued for a five year period and expires on December 31, 2006.

F. Proposed Limitations and Special Conditions

TABLE 1 – AGE Yard Facility 267

PARAMETER	FREQUENCY	LOCATION	LIMITATIONS
Light Non-Aqueous Phase Liquid (LNAPL) Thickness	Immediately Prior to each Injection, and Quarterly (measure and report all observances during the quarter)	All injection wells and all project associated monitoring wells	Monitor and Report
Hydrogen Peroxide: Concentration, Volume, Date Injected	Each Injection Event	44MW-11, 267IW-1, 267IW-2, and 267MW-3	Injection will be started in well 267IW-2 to verify that the temperature limitations are met. Up to a 7.0 % H ₂ O ₂ solution; maximum of 350 gallons per well per month; maximum of 4,200 gallons per quarter. Injection may not occur in a well that has had free product during the previous 3 months.
Temperature, pH, and Groundwater Elevation	Immediately Prior to Injection; Hourly for 24 hours after injection into well 267IW-2; Within 7 to 10 days after injection; Weekly for one month.	267IW-3	Field Parameters. Temperature after injection shall not exceed an additional 20°F.
Extended List of Volatile Organic Compounds (66 compounds) including Acetone, BTEX, MTBE, Tertiary Butyl Alcohol (TBA) and Tertiary Butyl Formate (TBF) by EPA Methods 8260B	Prior to injection and quarterly (Samples shall be taken no sooner than 10 days following injection event)	267IW-2 and 267IW-3	Monitor and Report
Total Iron (EPA Method 200.8), Alkalinity, Conductivity, ORP, Dissolved Oxygen	Prior to injection and quarterly (Samples shall be taken no sooner than 10 days following injection event)	267IW-2 and 267IW-3	Monitor and Report
Full Inorganic Scan (“Total Recoverable Metals”) using EPA Method 200 and 300 series (UIC Sample List 1); and Total Suspended Solids	Semi-annually during 1 st Q and 3 rd Q of each year, starting 3rd Q 2006 (Samples shall be taken no sooner than 10 days following injection)	267IW-2 and 267IW-3	Monitor and Report

TABLE 2 – Site SS-46

PARAMETER	FREQUENCY	LOCATION	LIMITATIONS
Dense Non-Aqueous Phase Liquid (DNAPL) Thickness	Immediately Prior to each Injection, and Quarterly (measure and report all observances during the quarter)	All injection wells and all project associated monitoring wells	Monitor and Report
Reagent Grade Potassium Permanganate: Concentration, Volume and Date Injected	After Each Injection	46IW-01, 46IW-02, 46MW-109, 46MW-86, and 46MW123	4% Solution KMnO ₄ 250 gallons maximum per well every 6 months. Monitor and Report.
RCRA-8 Metals by EPA Method 200.8 and 245.1 Iron (EPA Method 200.7) and Sulfate (EPA Method 300)	Quarterly (Samples shall be taken no sooner than 10 days following injection event)	46MW-133, 46MW-134, 46MW-135, 46MW-136, and 46MW-137	Concentrations may not exceed Primary and Secondary Drinking Water Standards.
Antimony, Manganese, and Thallium by EPA Method 200.8; and Uranium by EPA Method 200.8 or Total Isotopic Uranium by EPA Method 00-07	Semi-annually (Samples shall be taken no sooner than 10 days following injection event)	46MW-133	Concentrations may not exceed Primary and Secondary Drinking Water Standards. Uranium std. = 30 ug/L.
Full Volatile Scan utilizing EPA Method 8260B	Quarterly (Samples shall be taken no sooner than 10 days following injection event)	46MW-133, 46MW-134, 46MW-135, 46MW-136, and 46MW-137	Monitor and Report
Temperature, Turbidity, Conductivity, Oxidation Reduction Potential (ORP), Dissolved Oxygen (DO) and pH	Quarterly (Samples shall be taken no sooner than 10 days following injection event)	46MW-133, 46MW-134, 46MW-135, 46MW-136, and 46MW-137	Monitor and Report
Groundwater Elevation (amsl) and Depth to Groundwater	Quarterly	All Site-Related Monitoring Wells	Monitor and Report

G. Rationale for Permit Requirements

The permit conditions will help to ensure that the injectate does not adversely affect the existing water quality or hydrologic regime.

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Date: March 20, 2006

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